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Enterprise digital transformation and debt financing cost in China's A-share listed companies

JEL Classification: F270; G32

Keywords: *digital transformation; digital economy; debt financing cost; information asymmetry; agency problem*

Abstract

Research background: The rapid development of digital economy has set off a new wave of enterprise reform. Developing the digital economy is not only an urgent requirement of the current situation, but also an important way to meet the people's better life.

Purpose of the article: This paper attempts to reveal the important role of the development of digital technology on the debt financing cost of micro enterprises, and provide micro evidence for

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the integration of digital economy and real economy. At the same time, this paper wants to provide relevant guidance for formulating digital related policies and reducing the financing cost of the real economy.

Methods: Taking China's A-share listed companies from 2007 to 2020 as a sample, this paper empirically tests the impact of enterprise digital transformation on debt financing cost and its mechanism. In the robustness test, this paper uses the measures of changing independent variables and dependent variables, instrumental variable method and quantile regression method. In the mechanism test, this paper uses the intermediary effect model. In the further study, this paper uses the method of group regression.

Findings & value added: The study finds that the digital transformation of enterprises significantly reduces the cost of debt financing. Mechanism tests show that the role of enterprise digital transformation in reducing debt financing costs is mainly realized by reducing information asymmetry and alleviating agency problems. Further tests show that the relationship between enterprise digital transformation and debt financing cost is affected by the degree of market competition, whether it is a high-tech enterprise and audit quality. When the degree of market competition is high, the enterprise is a high-tech one, or it is audited by the four major international accounting firms, the effect of enterprise digital transformation on the reduction of debt financing cost is more significant. The method used in this paper is also applicable to the study of other economic management problems. This paper proves a positive significance of digital transformation, which is conducive to promoting the digital transformation of enterprises. Especially for those enterprises in non-high-tech industries, they should speed up the pace. At the same time, this paper has a certain guiding role for the introduction and implementation of policies to encourage digital transformation.

Introduction

The rapid development of digital economy has set off a new wave of enterprise reform. In the era of digital economy, the cost of timely communication is reduced and the ability to resist risks is improved. The development of digital economy is not only an urgent requirement of the current situation, but also an important way to ensure the people's better life. Digital economy has a scale effect, a scope effect and a network effect. As an important carrier of economic development, the enhancement of enterprises' digital capability is conducive to reducing mistakes and the probability of mistakes, improving operation efficiency and promoting industrial transformation and upgrading. All the companies are at the peak of digital development. They must seize the opportunity to make digital achievements benefit all people and the society (Barnes, 2020). Globally, the widespread implementation and digital technologies by corporations has given rise to a massive transformation with the potential to affect many corporations' internal operations and processes. This transformation affects different levels and steps of output creation in companies, including the way firms interact with consumers and the way they do business (Kretschmer & Khashabi, 2020). The existing studies have shown that corporate digital transformation helps to reduce corporate costs, increase corporate manage-

ment efficiency, and promote corporate technological progress (Zeng & Lei, 2021). In this context, it is of great academic value and practical significance to discuss the economic consequences of digital transformation. At present, scholars have studied the economic consequences of digital transformation on corporate performance, total factor productivity, merge and acquisitions, international strategy and other aspects (Zeng & Lei, 2021; Chen & Hao, 2022; Gao *et al.*, 2022), but less attention is paid to the impact of enterprise digital transformation on financing costs.

Reducing the financing cost of the real economy is one of the key tasks of supply-side structural reform. As China's capital market is still underdeveloped, debt capital is a more important financing channel for Chinese enterprises than equity capital. Debt financing cost not only reflects the cost of obtaining external financing, but also reflects the difficulty of obtaining external financing, which is related to the degree of financing constraints of enterprises and affects the future business performance of enterprises. Therefore, many papers have discussed the influencing factors of debt financing cost, including company characteristics, external environment, corporate governance, executive heterogeneity, shareholder heterogeneity, etc. (Anderson *et al.*, 2004; Pittman & Fortin, 2004; Bharath *et al.*, 2008; Xu *et al.*, 2019). This paper argues that enterprise digital transformation can also effectively reduce debt financing costs. On the one hand, digital transformation increases the technical level of things and alleviates firms' information asymmetry (Zeng & Lei, 2021; Tian *et al.*, 2022). According to the signaling theory (Spence, 2002; Bergh *et al.*, 2014), when enterprises effectively promote their digital transformation, they can use two ways — increase effective information disclosure, broaden information transmission channels to reduce the cost of information search — to reduce the degree of information asymmetry between creditors and enterprises, thus reducing debt financing costs; On the other hand, digital transformation of enterprises can weaken the discretion of management over daily business activities through a flatter organizational structure and form a real-time monitoring mechanism through business digitalization, enhancing the close attention and supervision of external stakeholders of all parties (Cenamor *et al.*, 2019; Cennamo & Santalo, 2019; Tian *et al.*, 2022; Meng *et al.*, 2022). It will reduce opportunistic behaviors of management and major shareholders, reduce agency conflicts, and reduce debt financing costs finally.

In the last five years, there have been almost 500 papers talking about digital transformation. As an emerging market and the largest developing country in the world, China's development path is of great reference value. Therefore, this paper chooses to use China's sample. Based on the above background, this paper takes Chinese A-share listed companies from 2007

to 2020 as samples to study the impact of digital transformation on debt financing cost and its transmission mechanism. It is found in this paper that enterprise digital transformation can significantly reduce the cost of debt financing. The conclusion still holds after the robustness test of changing measures, using instrumental variables, and performing quantile regression. Then, this paper studies the mechanism of corporate digital transformation on corporate debt financing cost. The results show that enterprise digital transformation has increased analysts' attention and research reports' attention, which indicates that digital transformation can reduce debt financing cost by reducing information asymmetry. Digital transformation of enterprises has increased management shareholding ratio and number of media coverage, which indicates that digital transformation can reduce debt financing costs by alleviating agency problems. Further study finds that the degree of competition in the market, whether it is a high-tech enterprise, and audit quality play important mediating roles on the relationship between enterprise digital transformation and debt financing costs. At the same time, digital transformation for the effects of debt financing costs in the high market competition degree group, high-tech enterprise group and high audit quality group is more significant.

The purpose of this paper attempts to reveal the important role of the development of digital technology on the debt financing cost of micro enterprises, and provide micro evidence for the integration of digital economy and real economy. At the same time, this paper wants to provide relevant guidance for formulating digital related policies and reducing the financing cost of the real economy. The contributions of this paper are mainly reflected in the following aspects: First, it enriched the research on the economic consequences of digital transformation. The existing literature discusses the economic consequences of digital transformation in corporate environmental performance, total factor productivity, international strategy, corporate social responsibility and other aspects. This paper connects China's digital transformation in the new era with capital cost, studies the relationship between enterprises' digital transformation and debt financing cost, and enriches the research on the economic consequences of digital transformation. As the second largest economy in the world, China is also an emerging economy in the world. Its growth process and development experience are worthy of reference by other emerging countries and regions in the world. Secondly, this paper improves the research on the influencing factors of debt financing cost. Research has explored the influence of shareholding structure, internal control, risk investment, solvency, corporate strategy, senior academic experience, information disclosure, enterprise mergers and acquisitions, charitable donations, external supervision and

financial ecological environment on debt capital. This paper finds that characteristics of the digital transformation of the company can also effectively reduce the cost of debt financing and improve the research on the factors affecting debt financing cost. Finally, the paper clarifies the mechanism of the impact of digital transformation on debt financing cost. In this paper, it is found that the reduction of the cost of debt financing by digital transformation of enterprises is realized through two ways—reducing information asymmetry and alleviating agency problems. And the mechanism of action between the two is clarified, providing ideas and methods for future research.

The rest of the paper is arranged as follows: the second part is the literature review; the third part is research methodology; the fourth part reports the results; the fifth part is the discussion; the sixth part is the conclusion.

Literature review

Digital transformation

Digital transformation of enterprises is an important stage for micro enterprises to follow the law of development under the high-quality development of digital economy in the new era. Seizing opportunities in the marketplace entails initiating and incorporating greater use of digital technology in the ways that firms undertake value-adding activities (Amankwah-Amoah *et al.*, 2021). It is an advanced way for enterprises to achieve innovation and progress. It refers to the process of deep integration of enterprises with science and technology elements to form a new business model. Digital transformation begins with the conversion of analog to digital information, followed by the use of digital technologies to improve business processes and change business models (Verhoef *et al.*, 2021). Digital transformation, by means of scientific and technological means, reallocates enterprise resources, breaks rigid internal structure, and reshapes enterprise business processes and means of operation. Enterprises after digital transformation will show brand-new functions and characteristics (Acemoglu, 2003), which also constitutes an important and far-reaching influence in the enterprise operation process, which involves all aspects of enterprises and is a process of comprehensive transformation.

Under the background of digital economy, the process of digital transformation of enterprises is developed rapidly, and scholars have also carried out a series of studies around digital transformation. Early literature on digital transformation mostly focuses on studying the path and counter-

measures of digital transformation, mainly normative articles (Adner *et al.*, 2019; Warner & Wager, 2019; Vial, 2019; Kretschmer & Khashabi, 2020). Researchers show that digital transformation help enterprises to optimize production processes (Earley, 2014), reshape organizational business form (Li, 2020; Kretschmer & Khashabi, 2020) and change value creation mode (Berman, 2012; Rachinger *et al.*, 2018). Now more and more scholars begin to study the impact of digital transformation of enterprises empirically, such as enterprise performance (Peng & Tao, 2022; Chen & Hao, 2022), risk-taking (Tian *et al.*, 2022), the total factor productivity (Zeng & Lei, 2021), corporate innovation (Wen *et al.*, 2022), merge and acquisition, corporate social responsibility (Meng *et al.*, 2022), international strategy (Gao *et al.*, 2022), etc.

After the digital transformation of the enterprise, its own information system will be more perfect and the measurement of various costs in production and operation will be more accurate, which will have a profound impact on the financial behavior of the enterprise (Matt *et al.*, 2015). Scholars have also carried out research in this area. Zeng and Lei (2021) reveal the influence of corporate digital transformation on TFP. Tian *et al.* (2022) find that digital transformation has a significant positive effect on corporate risk-taking. But in the research on the consequences of digital transformation, there is no literature on the financing cost.

Debt financing cost

Debt financing cost not only reflects the cost of obtaining external financing, but also reflects the difficulty of obtaining external financing, which is related to the degree of financing constraints of enterprises and affects the future business performance of enterprises. It is precisely because debt financing cost plays an important role in enterprise financing that how to reduce debt financing cost has become the focus of the industry.

The existing literature on the debt financing cost mainly studies the two aspects-corporate characteristics and corporate governance structure. There is some other literature focused on the impact of external factors on the debt financing cost.

In terms of company characteristics, it has been found that when the company is larger, the debt ratio is lower, the profitability is stronger, the growth is higher, the asset tangibility is higher, the interest coverage is higher, and the market risk is lower, the debt financing cost of the company is lower (Bhojraj & Sengupta, 2003; Yu, 2005; Bradley & Chen, 2011; Minnis, 2011). In the research of Bhojraj and Sengupta (2003), the authors find that the higher the independence of the board of directors, the higher

the bond grade, and the lower the debt financing cost; the higher the equity concentration, the lower the bond grade, and the higher the debt financing cost. Anderson *et al.* (2004) shows that the cost of debt financing is negatively related to the independence of the board of directors and the size of the board of directors, and the stronger the independence of the audit committee, the lower the cost of debt financing. The research of Pittman and Fortin (2004) shows that the debt financing cost of enterprises that choose the six major audit firms is lower. The research of Elyasiani *et al.* (2010) shows that stable institutional investors' shareholding can help alleviate the problem of information asymmetry and reduce the company's debt financing cost. Bradley and Chen (2011) find that good corporate governance helps reduce the cost of debt financing. In terms of external factors, Qian and Strahan (2007) find that in countries with better financial development level, the interest rate for enterprises to obtain bank loans is higher. Qi *et al.* (2010) find that political rights may affect the cost of debt and greater freedom of the press may provide an important channel for it.

Hypothesis development

This paper believes that the digital transformation process of enterprises can reduce the debt financing cost of enterprises by effectively reducing information asymmetry and alleviating agency problems.

On the one hand, the key factor determining the level of debt financing cost is the degree of information asymmetry between capital providers and capital demanders. Jaffee and Russell (1976) find that information asymmetry between banks and enterprises is the main cause of credit mismatch in the credit market. Therefore, effectively easing the information asymmetry between lenders and borrowers is of great importance to reduce the cost of corporate debt financing. In front of the digital transformation, because of the limitation of technology such as information of nature, the disclosure of the information is often layers of downlink. People need to take the initiative to dig for information. Creditors usually get access to business information by corporate annual reports, field research, or online collection methods so as to decide whether to lend or not. But through these ways, the effective information disclosure is less, the cost of information search is high, the information source channel is relatively scarce, the degree of information asymmetry between creditors and enterprises is high. When enterprises effectively promote their digital transformation, they can reduce the degree of information asymmetry between creditors and enterprises by increasing effective information disclosure and broadening information transmission channels and reducing information search costs.

First, digital transformation enables companies to be more efficient continuously, create more value, and promote the emergence of innovative business models such as platforms and ecosystems (Rachinger *et al.*, 2018; Cusumano *et al.*, 2019; Ghosh *et al.*, 2022). Digital transformation of enterprises means that enterprises can better use digital technology to process massive, non-standardized and unstructured internal and external data, encode and output it into structured and standardized information, which tend to improve the availability of information. At the same time, digital transformation, as a hot spot of current social concern, is in line with national policies in not only China, but also other countries in the world. Enterprises will be more proactive in their information disclosure and disclose more extensive content. Under the condition of better processing and output of effective information, enterprises' digital transformation can "push" information to market subjects; external creditors of enterprises can undoubtedly master more sufficient and comprehensive information than before (Zeng & Lei, 2021; Tian *et al.*, 2022). Second, with the help of cloud computing, big data and other latest scientific and technological means, enterprises can quickly connect with creditors directly after digital transformation. It makes business management and operations more transparent and helps stakeholders understand the willingness of the business in terms of governance (Kyaw *et al.*, 2022), which simplifies the information mining process, broadens the access channels of information, optimizes the information transmission process, and weakens the rigid transmission of information hierarchy. The original multi-level information transmission mode has become a flexible architecture with multi-channels, wide fields and fast pace. The digital transformation of enterprises improves the speed of information circulation, enhances the information processing ability, breaks down the barriers of internal and external information transmission of enterprises. As a result, it will greatly reduce the information search cost of creditors and the supervision cost of enterprises, and reduce the degree of information asymmetry between creditors and enterprises (Cenamor *et al.*, 2019; Cenamo & Santalo, 2019). What's more, the debt financing cost of enterprises will also be reduced as expected.

On the other hand, agency problem is also an important factor affecting debt financing cost. When borrowing, creditors will fully consider the agency problem caused by the conflict of interest between insiders and creditors (Jensen & Meckling, 1976; Boubakri & Ghouma, 2010), such as business empire building (Core *et al.*, 2003) and other tunneling behaviors that will increase the investment risks of creditors. Creditors demand a higher risk premium to compensate for their higher investment risk, which leads to higher debt financing costs. Therefore, how to alleviate the

agency problem is crucial to reduce the cost of debt financing. Digital transformation of enterprises can effectively alleviate the agency problem of management and major shareholders in a variety of ways.

First, based on information processing theory (Premkumar *et al.*, 2005), digital technologies can improve information processing capabilities and improve the responsiveness of companies. Based on the digital system, the decision-making system and the operating system can provide managers with more extensive, accurate and timely information helpful to decision-making (Brynjolfsson & McElheran, 2016). That is to say, the digital transformation of enterprises directly provides the management with more sufficient data information related to the production and operation of enterprises, reduces their dependence on experience and intuition when making decisions. It helps managers find problems in time, reduce irrationality in decision-making and alleviate management agency problems. Second, after the digital transition, enterprise organization structure will change (Kretschmer & Khashabi, 2020). The management of opportunistic behavior ability is abated and then the problem of agency will be alleviated. Third, enterprises' digital transformation can form real-time monitoring mechanism through business digitization. After digital transformation, enterprises will pay more attention to product quality, brand image and external reputation. Moreover, as a hot spot of social construction and development in the new era and new stage, enterprises undergoing digital transformation are more likely to receive close attention and supervision from external stakeholders and produces the "exposure effect" (Gilliland *et al.*, 2010; Orlitzky *et al.*, 2017). It increases the possibility that the opportunistic behaviors of the management and major shareholders will be discovered and disclosed. As a result, it reduces the motivation of the opportunistic behaviors of the management and major shareholders. It also reduces agency conflicts and thus reduces debt financing costs.

To sum up, this paper believes that enterprises' digital transformation can play a role in reducing debt financing costs by alleviating information asymmetry and agency problems. Therefore, the following hypothesis is proposed in this paper:

H1: *Digital transformation of enterprises can reduce debt financing costs.*

Research methods

Sample and data

Since China began to implement new accounting standards in 2007, this paper adopts China's A-share listed companies from 2007 to 2020 as the initial research sample. This paper selects samples according to the following procedures: First, financial listed companies are excluded in this paper, because the regulatory system and reporting structure of financial listed companies are quite different from those of other industries. Secondly, since the net assets of most specially treated (ST) companies are less than 0 and their business sustainability has some problems, ST companies are excluded in this paper. Thirdly, this paper deletes the samples with missing data. Finally, in order to reduce the influence of outliers on regression analysis, 1% winsorize is applied to both ends of continuous variables. According to the above criteria, a total of 23420 firm-year observations are obtained. And this paper applies a panel data model. The data in this paper are from the CSMAR database and CNRDS database.

Definition of variables

Digital transformation of enterprises. Words used by the managers can convey decision information (Jiang *et al.*, 2019; Li *et al.*, 2019). By analyzing documents released by firms, it can be inferred whether a firm is under the digital transformation process. Referring to Loughran and McDonald (2011), Loughran and McDonald (2020), Caserio *et al.* (2019), Cho and Muslu (2021), and Ertugrul *et al.* (2017), textual analysis has been widely implemented in top journals of finance, accounting and management. This paper counts the word frequency of digital keywords disclosed in the annual reports of listed companies in Shanghai and Shenzhen stock markets. Using the digital transformation indicators of listed companies in the database of CSMAR, the keyword list is constructed from five aspects: (1) artificial intelligence technology, (2) cloud computing technology, (3) blockchain technology, (4) big data technology and (5) digital technology application. To mitigate the right skewness problem, this paper uses the natural logarithm of digital transformation word counts. To avoid losing firm-year observations with zero keywords, this paper adds one to the actual values when calculating the natural logarithm (DEGREE), that is, degree of digital transformation (DEGREE) = $\ln(\text{Degree of digital transformation of listed companies} + 1)$.

Debt financing costs. Drawing on existing studies, this paper adopts two indicators to measure debt financing cost.

The ratio of interest expense to liabilities (DEBTCOST1) is equal to the ratio of interest expense to the company's total debt, multiplied by 100; The ratio of net financial expenses to liabilities (DEBTCOST2) is equal to the ratio of net financial expenses to corporate liabilities multiplied by 100. Net financial expense is the sum of interest expense, service fee expense and other financial expenses. The data comes from the financial expense breakdown item in the notes to the financial statements. DEBTCOST1 is used for the main test and DEBTCOST2 for the robustness test. At the same time, considering that the digital transformation of enterprises affects the debt financing cost with a certain time delay, and in order to alleviate the endogeneity problem, the dependent variable is advanced by one period into the regression as the core explained variable.

Control variables. Referring to Minnis (2011), this paper selects property rights nature, enterprise size, audit quality, financial leverage, profitability, growth, proportion of tangible assets, interest coverage multiple, cash flow, earnings variable and other variables as control variables. Refer to Table 1 for the specific variable definitions.

Model design

In this paper, the following model (1) is designed to verify hypothesis H1.

$$DEBTCOST_{i,t+1} = \beta_0 + \beta_1 DEGREE_{i,t} + \sum Control_{i,t} + +INDUSTRY + YEAR + \varepsilon_{i,t} \quad (1)$$

Where, DEBTCOST represents the debt financing cost of the enterprise, DEGREE represents the digital transformation of the enterprise, and Control is the relevant Control variable. Refer to Table 1 for the specific definition. If the coefficient is significantly less than 0, it indicates that the debt financing cost of enterprises is negatively correlated with the degree of digital transformation. That is, the stronger the degree of digital transformation is, the lower the debt financing cost of enterprises, thus supporting hypothesis H1.

In order to improve the reliability of regression results, the paper deals with the explanatory variable debt capital cost in the first stage, which not only considers that it takes a certain time for digital transformation to have an impact on debt financing cost, but also solves the endogenous problem

caused by reverse causality to a certain extent. In addition, clustering robust standard error adjusted T statistics are used in this paper. Meanwhile, dummy variables of year (YEAR) and industry (INDUSTRY) are also controlled to absorb fixed effects as much as possible.

Results

Descriptive statistics

This paper makes descriptive statistics on the variables of the study samples, and the results are shown in Table 2. Among them, the average (median) of debt financing cost (DEBTCOST1) is 2.1000 and 1.9438, respectively. The mean (median) of enterprise digital transformation (DEGREE) is 0.8414 and 0 respectively. The mean value (median) of property right (SOE) was 0.4217 and 0, respectively. The mean (median) of enterprise size (SIZE) was 22.2052 and 22.0216, respectively. The mean (median) of audit quality (BIG4) were 0.0646 and 0, respectively. The mean (median) of financial leverage (LEVER) was 0.4500 and 0.4456, respectively. The mean (median) of profitability (ROA) were 0.0393 and 0.0365, respectively. The mean (median) of growth (GROWTH) was 0.1997 and 0.1133, respectively. The average value (median) of the proportion of tangible assets to total assets (PPE) is 0.3856 and 0.3753, respectively. The average (median) of interest cover (INTEREST) was 0.1536 and 0.0977, respectively. The mean value (median) of cash flow (FCF) was 0.0430 and 0.0430 respectively. The mean (median) of surplus variable (LOSS) was 0.9213 and 1, respectively. The results are basically consistent with those in the literature.

Correlation analysis

Table 3 lists the correlation coefficients of the main variables in this paper, and the results indicate that there is a high negative correlation (significant at 1% level) between the variable representing enterprise digital transformation (DEGREE) and the variable representing enterprise debt financing cost (DEBTCOST1), which preliminarily supports hypothesis H1: enterprise digital transformation can reduce debt financing cost.

Multivariate analysis

Table 4 lists the regression analysis results of model (1). Considering that there is a certain time lag in the impact of enterprise digital transformation on debt financing cost, the dependent variable will be preceded by one period in this paper. Column (1) lists the regression results without adding control variables and without controlling the annual effect or the industry effect. Column (2) lists the regression results with adding control variables but without controlling the annual effect or the industry effect. Column (3) lists the regression results with adding control variables and controlling the annual effect and the industry effect. The results show that the coefficient of DEGREE is significantly negative in the above three regression results. According to the results in column (3), after controlling the relevant control variables, the coefficient of digital transformation (DEGREE) is -0.0758, and the T-value is -5.79, indicating that the digital transformation of enterprises can effectively reduce the debt financing cost. The higher the degree of digital transformation of enterprises, the lower the debt financing cost, which supports the hypothesis H1 above.

Robustness test

Substitute independent variable. In order to enhance the robustness of the conclusions of this paper, this paper uses the degree of enterprise digital transformation dummy variable (DUMMY) as the substitute variable of enterprise digital transformation to perform a regression on model (1). The regression results are shown in columns (1)–(3) of Table 5. The results show that after the change of digital transformation measurement method, the coefficient of digital transformation (DUMMY) in the above three columns of regression results is still significantly negative, which further supports the conclusion of this paper.

Substitute dependent variable. In order to enhance the robustness of the conclusion of this paper, DEBTCOST2 is used as the substitute variable of DEBTCOST1 to regression model (1), where DEBTCOST2= the ratio of net financial expense to the total liabilities of the company multiplied by 100, net financial expense is the sum of interest expense, service fee expense and other financial expenses. The regression results are shown in columns (1)–(3) of Table 6. The results show that after the change of the measurement method of debt financing cost, the coefficient of digital transformation degree (DEGREE) in the above three regression results is still significantly negative, which further supports the conclusion of this paper.

Instrumental variable method. In order to enhance the robustness of the conclusion of this paper, referring to Tian *et al.* (2022), this paper uses the general public finance science and technology expenditure and the Internet penetration rate of each province as the instrumental variable of digital transformation, and uses the two-stage least square method (2SLS) to endogenously process the model. The regression results are shown in Table 7. Among them, column (1) is the first-stage regression result using the general public finance science and technology expenditure and Internet penetration rate as instrumental variables, and column (2) is the second-stage regression result. The tool variables are subjected to over identification test, and the corresponding P-value of Sargan test was 0.9762. The original assumption of Sargan test is that the instrumental variables satisfy the exogenous. Its test method is to calculate the residual in the last stage of the instrumental variable method, and then take the residual as the dependent variable to regression the instrumental variable. If the instrumental variables are exogenous, then the regression coefficients of the instrumental variables should all be equal to 0. If the P-value is less than the threshold value, the original hypothesis is rejected, which indicates that the tool variables do not all meet the exogenous. If the p value in this paper is greater than 0.05, it can be considered that the tool variable meets the exogenous. The disadvantage of Sargan test is that it is only applicable to homovariance. As long as we do Sargan test, we need to add the two-step option to avoid the possibility of excessive rejection caused by heteroscedasticity. The corresponding P-value of Basman test is 0.9763. Basman test was also used to test the over-identification of instrumental variables. In order to ensure robustness, this paper reports the results of the two tests. Since P-values are greater than 0.05, all instrumental variables are considered exogenous. In the summary statistics of key diagnostic statistics, if the F-value is greater than 10, the tool variable is not a weak tool variable. Stock-yogo test is used to identify weak instrumental variables. When the minimum eigenvalue statistical value is greater than 16.38, it is considered that the tool variable is not a weak tool variable. Stock-yogo test has some limitations. It has an upper limit for the number of endogenous variables and tool variables. If the upper limit is exceeded, the test cannot be applied. The weak instrument variable test is performed on the tool variables and the F statistic is 116.005, which is greater than 10. The minimum characteristic statistic of Stock-yogo test is 116.005, which is greater than 16.38. Therefore, the original hypothesis of weak instrumental variables is rejected.

After controlling the endogeneity, this paper finds that the coefficient of the tool variable of digital transformation is -0.504, which is significant at the level of 1%, further supporting the conclusion of this paper.

Quantile regression. In order to avoid the influence of extreme values on the regression results, this paper adopts quantile regression method to regression model (1). Table 8 lists the results of the corresponding regression analysis. The results show that the coefficient of digital transformation (DEGREE) in the three columns is still significantly negative after using quantile regression, which further supports the conclusion of this paper.

Mechanism test

As mentioned above, digital transformation has a significant impact on debt financing cost. Information asymmetry and agency cost are the main mechanisms leading to this result. Based on this, this paper further analyzes the internal mechanism of digital transformation affecting debt financing cost. That is, whether digital transformation reduces the debt financing cost borne by enterprises by reducing the degree of information asymmetry and alleviating the agency problem.

Degree of information asymmetry. This part contains being watched by analysts and being paid attention to by the research reports.

In the first part, this paper shows the results of intermediary effect of the degree of attention by analysts. Securities analysts have better ways to collect information than ordinary investors, and they tend to have richer information. Meanwhile, analysts can not only accept external information, but also actively collect and dig information. Even when faced with the same historical information or stock market information, analysts can use information more effectively than ordinary investors. The number of analysts following is considered to be the main proxy variable of private information acquisition behavior, and is also considered as an indicator of the enterprise information environment, representing the market's attention to the enterprise (Lang *et al.*, 2003).

Based on this, referring to the research by Gao *et al.* (2022), this paper builds a recursive model of mediating effect and uses analyst attention as a variable to measure information asymmetry to test whether the degree of enterprise information asymmetry is the mediating mechanism of digital transformation affecting debt financing cost. Referring to the research of Bhushan (1989), this paper measured the attention of analysts by the number of analysts (teams) who have conducted tracking analysis on the company in that year.

Table 9 lists the corresponding regression results. This paper conducts Cluster processing on the company level for all the standard errors of regression coefficients. Column (1) shows the regression results of digital transformation on debt financing costs. Column (2) shows the regression

results of digital transformation on analysts' attention. After controlling for other influencing factors, the coefficient of digital transformation (DEGREE) is significantly positive at 1% level, indicating that companies with a greater degree of digital transformation have a higher proportion of analysts' attention and a lower degree of information asymmetry. Column (3) is the regression result of digital transformation on debt financing cost under the condition that analyst attention is controlled. The regression coefficient of digital transformation and analyst attention is significantly not 0, and the coefficient of digital transformation is -0.0696, whose absolute value is smaller than the absolute value of the regression coefficient of this variable in Column (1). It indicates that information asymmetry may be a part of the mediating variable of digital transformation affecting debt financing cost.

Table 10 shows the Sobel test results. Sobel in the Sobel test is the statistic of significance of mediation effect. It also shows the regression coefficients and significance of independent variables and intermediate variables in stepwise regression. Finally, it shows the proportion of intermediary effect and direct effect in the total effect. The advantage of the Sobel test is that it can test more intermediary effects than the stepwise test regression coefficient method. The disadvantage is that it is based on normal distribution and requires large samples. The Z-value of the mediating effect of analyst attention is -7.480, indicating that there is a significant mediating effect between digital transformation, analyst attention and debt financing cost. That is, digital transformation can reduce the degree of information asymmetry by increasing analysts' attention and thus reduce the debt financing cost of enterprises.

In the second part, this paper shows the results of intermediary effect according to the degree of the attention of the studied reports. Research reports is an important source for investors to obtain information. Analysts can also play the function of information transmission through research reports, improve information transparency of enterprises and reduce information asymmetry (Huang *et al.*, 2014).

Based on this, this paper builds a recursive model of mediating effect, and uses the attention of the studied reports as a variable to measure information asymmetry to test whether the degree of enterprise information asymmetry is the mediating mechanism of digital transformation affecting debt financing cost. In this paper, the number of research reports that tracked and analyzed the company in that year is used to measure the attention of the studied reports.

Table 11 lists the corresponding regression results. This paper conducts Cluster processing on the company level for all the standard errors of regression coefficients. Column (1) shows the regression results of digital

transformation on debt financing costs. Column (2) shows the regression results of digital transformation on research report attention. After controlling other influencing factors, the coefficient of digital transformation (DEGREE) is significantly positive at 1% level, indicating that companies with a greater degree of digital transformation have a higher proportion of research report attention and a lower degree of information asymmetry. Column (3) is the regression result of digital transformation on debt financing cost under the control of research attention. The regression coefficient of digital transformation and research attention is significantly not 0, and the coefficient of digital transformation is -0.0694, its absolute value being less than the absolute value of the regression coefficient of this variable in Column (1). This indicates that the attention of research reports may be a part of the intermediary variable of the impact of digital transformation on debt financing cost.

Then, this paper also conducted Sobel test on the above results. Table 12 shows the test results. The Z-value of the mediating effect of research report attention is -7.427, indicating that there is a significant mediating effect between digital transformation, research report attention and debt financing cost. That is to say, digital transformation can reduce information asymmetry by enhancing the attention of research reports and thus reduce the debt financing cost of enterprises.

The problem of agency. This part contains management shareholding and the number of media coverage.

In the first part, this paper talk about the results of intermediary effect according to the management ownership.

The agency problem between shareholders and management in modern enterprises arises from ownership and management right. Management incentive is an effective method to solve agency conflict. Management stock ownership is an incentive mechanism within an enterprise. By holding shares in a company, management can have a share in the company's operating results, and their interests are aligned with those of shareholders, thus working harder. This is also known as the "Convergence of Interests Hypothesis" (Jensen & Meckling, 1976; Lichtenberg & Palia, 1999). However, some scholars have pointed out that if the shareholding ratio of management is too high, it may occupy the wealth of shareholders, which is the "Manager Defense Hypothesis" (Fama & Jensen, 1983). In China, due to the late birth of equity incentive and the imperfect incentive mechanism, the vast majority of studies on management shareholding ratio follow the "Interest Convergence Hypothesis". Agency costs attributable to the divergence of interests vary inversely with the manager's ownership stake (Ang

et al., 2000). That is to say, the higher the management shareholding, the less serious the agency problem.

Based on this, this paper builds a recursive model of intermediary effect, and uses management ownership as a variable to measure agency cost to test whether enterprise agency cost is the intermediary mechanism of digital transformation affecting debt financing cost. Referring to the research by Stulz (1988), the ratio of the number of management shares to the total equity is used to measure management shares.

Table 13 lists the corresponding regression results. In this paper, the standard errors of all regression coefficients are clustered at the company level. Column (1) shows the regression results of digital transformation on debt financing costs. Column (2) shows the regression results of digital transformation on management ownership. After controlling for other influencing factors, the coefficient of DEGREE is significantly positive at 1% level, indicating that the higher the degree of digital transformation, the higher the proportion of management ownership and the smaller the agency problem. Column (3) shows the regression result of digital transformation on debt financing cost under the condition that management shareholding is controlled. The regression coefficients of digital transformation and management shareholding are not 0 significantly, and the coefficient of digital transformation is -0.0779, its absolute value being smaller than the absolute value of the regression coefficient of this variable in Column (1). It indicates that management ownership may be part of the intermediary variable affecting the debt financing cost of digital transformation.

Then, this paper also conducted the Sobel test on the above results. Table 14 shows the test results. The Z value of the intermediary effect of management ownership is -4.050, indicating that there is a significant intermediary effect between digital transformation, management ownership and debt financing costs. That is to say, digital transformation alleviates agency problems by improving management shareholding ratio and thus reduces debt financing costs of enterprises.

In the second part, this paper talks about the results of intermediary effect according to the media coverage.

The media play an important role in modern corporate governance, which can not only produce and deliver information, but also undertake the task of improving corporate governance. Financial information disclosed by enterprises is an important channel for external investors to obtain information, and managers are motivated to manipulate accounting earnings for personal gain (Healy, 1985; Bergstresser & Philippon, 2006), which makes it impossible for external investors to obtain real information about enterprises, resulting in agency problems. The media can participate in corporate

governance because of its influence on the market value of the company and its supervision over the company and managers (Dyck *et al.*, 2008; Liu & McConnell, 2013). At present, there is much literature discussing the supervision role of media from the perspective of principal-agent. As a third-party monitoring body, media can not only evaluate companies (Bednar, 2012; Bednar *et al.*, 2013), but also cause the involvement of relevant departments and other external supervisors (Dyck *et al.*, 2008), so as to improve the level of corporate governance and alleviate internal and external agency problems of enterprises.

Based on this, this paper builds a recursive model of intermediary effect, and uses media coverage as a variable to measure agency cost to test whether enterprise agency cost is the intermediary mechanism of digital transformation affecting debt financing cost. Referring to the research of Xu *et al.* (2016), this paper represents the number of media coverage of corresponding companies by the number of mentions of company names in news headlines.

Table 15 lists the corresponding regression results. This paper conducts Cluster processing on the company level for all the standard errors of regression coefficients. Column (1) shows the regression results of digital transformation on debt financing costs. Column (2) is the regression result of digital transformation on media coverage. After controlling for other influencing factors, the coefficient of digital transformation degree (DEGREE) is significantly positive at the 1% level, indicating that companies with a greater degree of digital transformation have a higher proportion of media coverage and a smaller agency problem. Column (3) is the regression result of digital transformation on debt financing cost under the control of media coverage. The regression coefficient of digital transformation and media coverage is significantly not 0, and the coefficient of digital transformation is -0.0732, its absolute value being lower than the absolute value of the regression coefficient of this variable in Column (1). It indicates that media coverage may be part of the mediating variable of digital transformation affecting debt financing cost.

Then, in this paper, the above results are the same as the Sobel test, shown in Table 16. The Z value is -4.058, which is significant. Media coverage has remarkable intermediary effect between digital transformation and debt financing costs. That is, digital transformation alleviates agency problems by improving the number of media coverage and then reduces corporate debt financing costs.

Further test

As mentioned above, digital transformation has a significant impact on debt financing cost. Furthermore, this paper explores which factors can moderate the impact of digital transformation on the debt financing costs. Specifically, this paper discusses the influence of the degree of market competition, high-tech enterprise and big four audit on this process.

Degree of market competition. The motivation of enterprise digital transformation is affected by its environment. The environment and the market are constantly changing. Faced with ever more intense market competition, the enterprises' successful experience of the past is no longer suitable for future development. There is an urgent need to find new growth opportunities and development patterns. The digital transformation uses digital technology and the implementation of innovation as the core, providing new growth space and development opportunities for enterprises in product upgrading, value remodeling, business reform, business model innovation, market strategy adjustment and other aspects, so that enterprises can advance the layout of the digital economy in the emerging market. In the highly competitive and uncertain environment, enterprises need high-frequency decision making, and the tool of decision making is digitization. Enterprises need to make use of the interconnection of "human, machine, material, law and environment" to make all kinds of data flow automatically to resolve the uncertainty of complex systems. Based on this, this paper speculates that when the market competition is higher, enterprises are more willing to implement digital transformation and can more effectively reduce the debt financing cost of enterprises.

In order to distinguish the influence of different levels of competition on the regression results, this paper adopts the grouping regression method to distinguish the level of competition for model (1). This paper adopts the market share of enterprises to measure the degree of market competition. Enterprise market share equals the proportion of the operating revenue of a single enterprise in the total operating revenue of all enterprises in the industry. The smaller the market share of an enterprise, the higher the competition it faces. Table 17 lists the corresponding regression analysis results. The results show that the higher degree of competition, the higher digital transformation (DEGREE) coefficient absolute value is. It can indicate that the degree of competition affects the digital transformation, and therefore, it can be an important factor of debt financing cost relationship. In the case of the higher degree of market competition, enterprise's desire to digital transition is stronger, which can finally result in lowering the cost of debt financing. It further supports the conclusion of this paper.

High-tech enterprise. As the main body of the national and industrial innovation system, enterprises build the dual-core of enterprise innovation through the innovation elements, such as technology investment and R&D and the use of new technologies (Gao *et al.*, 2022). Due to the great differences in industrial chain characteristics among different industries, enterprises will also have different levels of digital technology application in the process of digital transformation. Digital transformation needs strong innovation foundation support, while high-tech enterprises can effectively meet the innovation technology conditions required by digital transformation, and can effectively embed digital transformation deeply into their organizational structure, decision-making system and production process. Therefore, compared with other enterprises, high-tech enterprises have more innovation activities and are more skilled in technological means and have a higher degree of digitalization. Based on this, the paper concludes that high-tech enterprises can more skillfully use high-tech to carry out digital transformation, which has a higher degree of digital transformation and can more effectively reduce the debt financing cost of enterprises.

In order to distinguish whether high-tech enterprises have an impact on regression results, this paper distinguishes whether high-tech industries have an impact on regression results, and adopts grouping regression method to perform regression on model (1). According to the industry classification standard of China Securities Regulatory Commission in 2012, the listed companies in pharmaceutical manufacturing industry (C27), computer, communication and other electronic equipment manufacturing industry (C39), information transmission, software and information technology service industry (I), scientific research and technology service industry (M) are defined as high-tech enterprises, while other industries are non-high-tech enterprises. Table 18 lists the corresponding regression analysis results. The results show that when the enterprise in the high and new technology industry, the digital transformation (DEGREE) coefficient absolute value is greater, which means that high tech industry indeed affects the relationship between digital transformation and debt financing cost. These enterprises in high-tech industry are able to lower the debt financing cost easier by digital transformation.

Big Four audit. Digital transformation of enterprises means that enterprises will adopt some new technologies, new models and new forms of business. Facing various new changes of enterprises, the office also needs to invest certain human resources, material resources and financial resources to effectively adapt to all kinds of new changes. In recent years, the international *Big Four* accounting firms have invested a lot of money and resources in the research and development of big data and other infor-

mation technology and audit technology. Compared with domestic firms, the international *Big Four* accounting firms are well prepared in terms of technology and talents and can better adapt to the transformation in the era of digital economy. Therefore, compared with domestic firms, the international *Big Four* accounting firms can better identify the degree of digital transformation of enterprises, have higher audit quality and can more effectively reduce debt financing costs. Based on this, this paper speculates that digital transformation has a more obvious effect on the reduction of debt financing cost when the enterprise is audited by the Big Four accounting firms.

In order to distinguish the influence of different audit quality on regression results, referring to the research of Gul *et al.* (2010), this paper rerun model (1) with the method of grouping regression based on whether it is audited by the international Big Four accounting firms. Table 19 lists the corresponding regression analysis results. The absolute value of the coefficient of the digital transformation (DEGREE) in high audit quality group is bigger, which shows that audit quality indeed affects the relationship between digital transformation and debt financing cost. When the company is audited by one of the Big Four auditing firms, the digital transformation can have a greater effect on lowering the cost of debt financing.

Discussion

The main research results of this paper show that digital transformation can reduce the cost of debt capital. The research results of this paper are consistent with the research findings of Zeng and Lei (2021), Meng *et al.* (2022) and Ionescu *et al.* (2022). They all believe that digital transformation can affect the daily operation and behavior decisions of enterprises. However, previous studies have focused on the subsequent impacts of digital transformation including corporate total factor productivity, the corporate sustainability performance and corporate social responsibility, etc. They have not proved the relationship between digital transformation and debt financing cost, and this paper confirms this. This paper believes that financing cost is one of the most classical problems in corporate finance and the key to the long-term development of enterprises. According to the paper, although all of them are studying digital transformation, the choice of financing cost as a dependent variable has more important practical significance than studying other issues. In addition, the cost of debt financing is one of the key channels of enterprise financing. Therefore, it has pro-

found theoretical and practical significance to select debt financing cost for research in this paper.

As for the mechanism, previous research done by Gao *et al.* (2022) also uses the intermediary effect model. However, it shows that corporate innovation exhibits the intermediary effect, which is different from that in this paper. The results of mechanism research in this paper show that digital transformation can reduce the degree of information asymmetry and alleviate the agency problem and then decrease the cost of debt financing. It is very important to explore the mechanism of the impact of digital transformation because it is conducive to guiding subsequent research. Different from previous studies, this paper finds two new mechanisms for digital transformation to exert influence, which is undoubtedly significant. Because this will be conducive to subsequent exploration by scholars interested in this topic. They are no longer limited to the existing mechanism since this paper provides more options for follow-up research.

In the part of further study, this paper examines the impact of market competition, high-tech enterprises and *Big Four* audits. This paper finds that when the market competition is high, the enterprise is in high-tech industry and the enterprise is audited by the fourth big international accounting firms, the digital transformation of the enterprise has a more significant effect on reducing the debt financing cost. Existing literature has also explored the factors that may affect the process of digital transformation. Chen and Hao (2022) explore the moderating role of board characteristics between digital transformation and corporate environmental performance. Meng *et al.* (2022) find that board independence and institutional ownership moderate the relationship between digital transformation and corporate social performance. Tian *et al.* (2022) find that the ownership of the firm affects the relationship between digital transformation and risk-taking. Like Zeng and Lei (2021) and Gao *et al.* (2022), this paper chooses to group according to whether it is a high-tech enterprise. However, the other two influencing factors selected in this paper are different from previous papers. This part is the highlight of this article, which reflects the author's more comprehensive thinking on digital transformation and contains many details. The actual operation process of an enterprise is complex, and there are many factors that are difficult to quantify. All these may affect the role of digital transformation in reducing debt financing costs. However, this part gives examples to illustrate the factors that may affect the role of digital transformation. In this part, this paper puts digital transformation under the overall environment of enterprise operation, taking into account industry factors, industry factors and information environment, so as to make this article fuller and complete. The logical framework is also more

realistic. Therefore, this paper not only enriches the theory, but also guides the practice.

Conclusions

Accelerating the digital transformation of enterprises is not only the key task of developing digital economy, but also the inevitable choice of deepening supply-side structural reform and promoting high-quality economic and social development. This paper studies the impact of enterprise digital transformation on debt financing cost. It is found that enterprise digital transformation can effectively reduce debt financing cost, and the stronger the degree of enterprise digital transformation, the lower the debt financing cost. The above conclusion still holds under a series of robustness tests. The mechanism study shows that the reduction of debt financing cost of enterprises with strong degree of digital transformation is mainly achieved by reducing the degree of information asymmetry and alleviating agency problems. Among them, being paid attention to by analysts and being paid attention to by research reports are two ways that digital transformation affects debt financing cost by influencing the degree of information asymmetry, while management shareholding and media coverage are two ways that digital transformation affects debt financing cost by influencing agency problem. Further test shows that the relationship between digital transformation and debt financing cost is affected by the degree of market competition, high-tech enterprises and audit quality. Specifically, when the competition is more intense, the degree of digital transformation has a stronger effect on the reduction of debt financing cost. When enterprises are in the high-tech industry, the degree of digital transformation has a stronger effect on the reduction of debt financing cost. When an enterprise is audited by the *Big Four* accounting firms, the degree of digital transformation plays a stronger role in reducing debt financing costs.

Based on the above conclusions, this study has the following policy implications. First, enterprises should attach importance to the important role of digital development in reducing debt financing costs and accelerate digital transformation. The 14th Five-Year Plan is a critical period for China to accelerate the construction of digital economy, and data is becoming an important driving force for the high-quality development of industrial economy. The conclusion of this paper shows that digital transformation of enterprises can produce positive effects and effectively reduce the cost of debt financing. Therefore, enterprises should speed up the pace of digital transformation and further promote the deep integration of digital economy

and real economy. Second, high-tech enterprises should seize the opportunity, dare to reform, give full play to their digital technology advantages, optimize corporate governance through digital transformation, and reduce financing costs. This paper finds that high-tech enterprises have a higher degree of digital transformation and can effectively reduce their own debt financing costs. This is because digital transformation needs strong innovation foundation support, and high-tech enterprises can effectively meet the innovation technology conditions required by digital transformation. Therefore, it is suggested that high-tech enterprises give full play to their digital technology advantages and carry out digital transformation in a timely manner. Third, enterprises engaged in digital transformation should hire high-quality external audit to accelerate the realization of digital transformation results. Digital transformation of enterprises means that enterprises will adopt some new technologies, new models and new forms of business. Facing various new changes of enterprises, the office also needs to invest certain manpower, material resources and financial resources to effectively adapt to all kinds of new changes. Compared with domestic firms, the international Big Four accounting firms have been well prepared in terms of technology and talents, which can better adapt to the transformation of the digital economy era, identify the degree of enterprise digital transformation, and accelerate the realization of digital transformation results. In addition, this paper provides impetus for enterprises that have not yet or are in the process of digital transformation, and also provides references for decision-making behaviors of external investors.

This paper also has some limitations. First, the sample of this paper only considers Chinese A-share listed companies in Shanghai and Shenzhen. This paper does not consider the companies listed in Hong Kong stock market, the companies listed in other countries and regions and the non-listed companies. Second, in terms of variable measurement of digital transformation, this paper uses the number of keywords which describes digital transformation from five aspects as stated above in the annual report to measure. However, the annual report is more of a text level measurement. In the future, more accurate measurement methods should be further considered to accurately measure the extent of the company's digital transformation in actual operation. Third, besides the degree of information asymmetry and the problem of agency, there may be other influence mechanisms. This issue therefore remains a promising direction for future work.

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Annex

Table 1. Variable definitions

Identification	Name	Definition
DEGREE	Digital transformation	After adding 1 to the value of digital transformation degree, the logarithm value is taken.
DUMMY	Digital transformation dummy variable	Those with digital transformation records are marked as 1, while others are marked as 0.
DEBTCOST1	Debt financing cost	The ratio of interest expense to the company's total liabilities multiplied by 100.
DEBTCOST2	Debt financing cost	The ratio of net financial expense to the company's total liabilities, multiplied by 100. Net financial expense is the sum of interest expense, service fee expense and other financial expenses.
SOE	The nature of property right	A dummy variable that is equal to 1 if a firm is state-owned, and 0 otherwise.
SIZE	Corporate scale	Natural logarithm of total assets
BIG4	Audit quality	The value is 1 for enterprises audited by the Big Four accounting firms, and 0 for others.
LEVER	Financial leverage	Total liabilities divided by total assets.
ROA	Profitability	Net profit divided by total assets.
GROWTH	Growth ability	The difference between the current year's operating income and the previous year's operating income divided by the previous year's operating income.
PPE	Proportion of tangible assets to total assets	Fixed assets and inventory divided by total assets.
INTEREST	Interest coverage multiple	EBIT divided by interest expense.
FCF	The cash flow	Net cash flow from operating activities divided by total assets.
LOSS	Surplus variables	A dummy variable that is equal to 1 if the net profit of current years is positive, and 0 otherwise.
ANAATT	Analyst attention	How many analysts (teams) have covered the company in a year.

Table 1. Continued

Identification	Name	Definition
REPORTATT	Research reports attention	How many research reports have tracked the company in a year.
MSHARES	Management ownership	The ratio of the number of management shares to the total equity.
TITLE	Number of media coverage	The company's news totals appear in newspaper financial headlines
COMPETE	Degree of market competition	The proportion of the operating revenue of a single enterprise to the total operating revenue of all enterprises in the industry
TECH	High-tech enterprise	Listed companies in pharmaceutical manufacturing industry (C27), computer, communication and other electronic equipment manufacturing industry (C39), information transmission, software and information technology service industry (I), scientific research and technology service industry (M) are high-tech enterprises, while other industries are non-high-tech enterprises.
YEAR	Year	Year dummy variable
INDUSTRY	Industry	Industry dummy variable

Table 2. Descriptive statistics

Identification	N	MEAN	SD	MIN	P25	P50	P75	MAX
DEBTCOST1	23420	2.1000	1.4698	0.0047	0.8864	1.9438	3.0690	6.3232
DEBTCOST2	23420	2.2776	1.5122	0.0341	1.0476	2.1224	3.2618	6.7120
DEGREE	23420	0.8414	1.2155	0.0000	0.0000	0.0000	1.3863	4.6347
DUMMY	23420	0.2946	0.3427	0.0000	0.0000	0.0000	0.6931	0.6931
SOE	23420	0.4217	0.4938	0.0000	0.0000	0.0000	1.0000	1.0000
SIZE	23420	22.2052	1.3042	18.2659	21.2714	22.0216	22.9376	28.6365
BIG4	23420	0.0646	0.2459	0.0000	0.0000	0.0000	0.0000	1.0000
LEVER	23420	0.4500	0.1959	0.0731	0.2970	0.4456	0.5979	0.8704
ROA	23420	0.0393	0.0488	-0.1641	0.0150	0.0365	0.0641	0.1796
GROWTH	23420	0.1997	0.5841	-0.8635	-0.0238	0.1133	0.2860	4.0146
PPE	23420	0.3856	0.1792	0.0325	0.2526	0.3753	0.5099	0.8076
INTEREST	23420	0.1536	0.3571	-1.3869	-0.0008	0.0977	0.2938	1.5222
FCF	23420	0.0430	0.0697	-0.1671	0.0053	0.0430	0.0842	0.2339
LOSS	23420	0.9213	0.2692	0.0000	1.0000	1.0000	1.0000	1.0000

Note: The command used is tabstat. Executor: Zixi Zhang.

Table 3. Correlation analysis

Variable	DEBTOSTI	DEBTOST2	DEGREE	DUMMY	SOE	SIZE	BIG4	LEVER	ROA	GROWTH	PPE	INTEREST	FCF	LOSS
DEBTOSTI	1													
DEBTOST2	0.979**	1												
DEGREE	-0.167**	-0.169**	1											
DUMMY	-0.159**	-0.161**	0.805**	1										
SOE	0.047**	0.036**	-0.185**	-0.167**	1									
SIZE	0.058**	0.041**	0.040**	0.062**	0.341**	1								
BIG4	-0.0110	-0.017**	-0.026**	-0.015**	0.152**	0.371**	1							
LEVER	0.314**	0.298**	-0.104**	-0.088**	0.306**	0.485**	0.108**	1						
ROA	-0.273**	-0.261**	0.00900	0.0100	-0.103**	-0.027**	0.042**	-0.362**	1					
GROWTH	-0.016**	-0.016**	0.046**	0.030**	-0.035**	0.081**	0.00500	0.068**	0.145**	1				
PPE	0.236**	0.226**	-0.338**	-0.269**	0.227**	0.152	0.026**	0.320**	-0.155**	-0.019**	1			
INTEREST	0.316**	0.314**	-0.079**	-0.064**	0.108**	0.135**	0.00100	0.315**	-0.104**	0.00100	0.179**	1		
FCF	-0.105**	-0.099**	-0.024**	-0.011*	0.043**	0.063**	0.087**	-0.126**	0.338**	0.013**	0.064**	-0.032**	1	
LOSS	-0.154**	-0.152**	0.00200	0.012*	-0.022**	0.049**	0.027**	-0.138**	0.617**	0.116**	-0.057**	0.176**	0.129**	1

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively. The command used is `pwcorr_a`. Executor: Zixi Zhang.

Table 4. Digital transformation and debt financing costs

Variable	(1) DEBTCOST1	(2) DEBTCOST1	(3) DEBTCOST1
<i>DEGREE</i>	-0.2015*** (-15.03)	-0.1269*** (-10.49)	-0.0758*** (-5.79)
<i>SOE</i>		-0.2197*** (-5.04)	-0.4161*** (-9.85)
<i>SIZE</i>		-0.0543*** (-3.06)	-0.0051 (-0.29)
<i>BIG4</i>		0.0151 (0.18)	-0.0874 (-1.09)
<i>LEVER</i>		1.3655*** (11.67)	1.7029*** (14.75)
<i>ROA</i>		-3.0405*** (-8.09)	-3.5218*** (-9.51)
<i>GROWTH</i>		0.0152 (1.00)	-0.0006 (-0.04)
<i>PPE</i>		0.8300*** (6.66)	0.7439*** (6.12)
<i>INTEREST</i>		1.0434*** (22.17)	0.9221*** (21.11)
<i>FCF</i>		-0.6253*** (-3.09)	-1.1470*** (-6.06)
<i>LOSS</i>		-0.5564*** (-9.14)	-0.4624*** (-7.99)
<i>CONSTANT</i>	2.2696*** (85.42)	3.0659*** (8.10)	3.3799*** (8.71)
<i>YEAR</i>	No	No	Yes
<i>INDUSTRY</i>	No	No	Yes
<i>N</i>	23420	23420	23420
<i>R²</i>	0.028	0.219	0.297
<i>R² Adjusted</i>	0.028	0.218	0.295
<i>F</i>	225.8938	202.9711	100.1732

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is reg. Executor: Zixi Zhang.

Table 5. Robustness test: substitute dependent variable

Variable	(1) DEBTCOST1	(2) DEBTCOST1	(3) DEBTCOST1
<i>DUMMY</i>	-0.6809*** (-15.14)	-0.4511*** (-11.74)	-0.2703*** (-6.88)
<i>SOE</i>		-0.2203*** (-5.04)	-0.4151*** (-9.83)
<i>SIZE</i>		-0.0524*** (-2.96)	-0.0054 (-0.30)
<i>BIG4</i>		0.0178 (0.22)	-0.0846 (-1.06)
<i>LEVER</i>		1.3575*** (11.62)	1.7038*** (14.79)
<i>ROA</i>		-3.0276*** (-8.04)	-3.5063*** (-9.46)

Table 5. Continued

Variable	(1) DEBTCOST1	(2) DEBTCOST1	(3) DEBTCOST1
<i>GROWTH</i>		0.0107 (0.70)	-0.0027 (-0.18)
<i>PPE</i>		0.8898*** (7.32)	0.7598*** (6.31)
<i>INTEREST</i>		1.0445*** (22.09)	0.9216*** (21.05)
<i>FCF</i>		-0.6168*** (-3.04)	-1.1440*** (-6.05)
<i>LOSS</i>		-0.5511*** (-9.04)	-0.4595*** (-7.93)
<i>CONSTANT</i>	2.3006*** (83.59)	3.0254*** (7.98)	3.3833*** (8.75)
<i>YEAR</i>	No	No	Yes
<i>INDUSTRY</i>	No	No	Yes
<i>N</i>	23420	23420	23420
<i>R²</i>	0.025	0.219	0.297
<i>R² Adjusted</i>	0.025	0.219	0.296
<i>F</i>	229.0714	203.1816	100.4450

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is reg. Executor: Zixi Zhang.

Table 6. Robustness test: substitute dependent variable

Variable	(1) DEBTCOST2	(2) DEBTCOST2	(3) DEBTCOST2
<i>DEGREE</i>	-0.2105*** (-15.19)	-0.1377*** (-11.04)	-0.0819*** (-6.09)
<i>SOE</i>		-0.2389*** (-5.31)	-0.4508*** (-10.33)
<i>SIZE</i>		-0.0683*** (-3.74)	-0.0099 (-0.54)
<i>BIG4</i>		0.0079 (0.10)	-0.1073 (-1.34)
<i>LEVER</i>		1.3608*** (11.38)	1.6586*** (14.09)
<i>ROA</i>		-2.8148*** (-7.07)	-3.3808*** (-8.59)
<i>GROWTH</i>		0.0181 (1.16)	0.0026 (0.17)
<i>PPE</i>		0.7914*** (6.19)	0.7540*** (6.04)
<i>INTEREST</i>		1.0925*** (22.44)	0.9696*** (21.39)
<i>FCF</i>		-0.5529*** (-2.64)	-1.0750*** (-5.48)
<i>LOSS</i>		-0.6043*** (-9.61)	-0.5108*** (-8.48)
<i>CONSTANT</i>	2.4547*** (90.34)	3.6122*** (9.25)	3.7098*** (9.32)

Table 6. Continued

Variable	(1)	(2)	(3)
	DEBTCOST2	DEBTCOST2	DEBTCOST2
<i>YEAR</i>	No	No	Yes
<i>INDUSTRY</i>	No	No	Yes
<i>N</i>	23420	23420	23420
<i>R</i> ²	0.029	0.211	0.289
<i>R</i> ² <i>Adjusted</i>	0.029	0.210	0.288
<i>F</i>	230.8436	199.8265	96.5023

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is reg. Executor: Zixi Zhang.

Table 7. Robustness test: IV-2SLS regression

Variable	(1)	(2)
	DEGREE	DEBTCOST1
<i>EXPENSE</i>	8.588*** (2.001)	
<i>IE</i>	0.00436*** (0.000759)	
<i>DEGREE</i>		-0.504*** (0.158)
<i>SOE</i>	-0.168*** (0.0185)	-0.475*** (0.0425)
<i>SIZE</i>	0.0880*** (0.00856)	-0.0131 (0.0209)
<i>BIG4</i>	-0.125*** (0.0364)	-0.119* (0.0639)
<i>LEVER</i>	-0.00792 (0.0576)	1.943*** (0.1000)
<i>ROA</i>	-0.347 (0.257)	-4.205*** (0.448)
<i>GROWTH</i>	0.0574*** (0.0137)	0.0504** (0.0255)
<i>PPE</i>	-0.982*** (0.0522)	0.523*** (0.189)
<i>INTEREST</i>	-0.0526** (0.0230)	0.807*** (0.0411)
<i>FCF</i>	-0.130 (0.125)	-1.076*** (0.219)
<i>LOSS</i>	0.101*** (0.0383)	-0.433*** (0.0685)
<i>CONSTANT</i>	-0.855*** (0.191)	2.908*** (0.343)
<i>YEAR</i>	Yes	Yes
<i>INDUSTRY</i>	Yes	Yes
<i>N</i>	13009	13009

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is ivregress2. Executor: Zixi Zhang.

Table 8. Robustness test: quantile regression

Variable	(1) DEBTCOST1	(2) DEBTCOST1	(3) DEBTCOST1
<i>DEGREE</i>	-0.2125*** (-19.24)	-0.1102*** (-11.54)	-0.0645*** (-5.90)
<i>SOE</i>		-0.2921*** (-12.17)	-0.4498*** (-17.89)
<i>SIZE</i>		-0.0160 (-1.51)	0.0123 (1.09)
<i>BIG4</i>		-0.0385 (-0.82)	-0.0973** (-2.05)
<i>LEVER</i>		1.3689*** (18.57)	1.7363*** (22.39)
<i>ROA</i>		-3.4727*** (-10.71)	-3.5902*** (-11.01)
<i>GROWTH</i>		0.0337* (1.80)	0.0151 (0.81)
<i>PPE</i>		1.2568*** (18.58)	1.0308*** (14.45)
<i>INTEREST</i>		1.3307*** (40.21)	1.2000*** (36.17)
<i>FCF</i>		-1.0583*** (-6.35)	-1.3457*** (-7.85)
<i>LOSS</i>		-0.4831*** (-9.04)	-0.4669*** (-8.75)
<i>CONSTANT</i>	2.1445*** (131.38)	1.8344*** (8.35)	2.7438*** (11.08)
<i>YEAR</i>	No	No	Yes
<i>INDUSTRY</i>	No	No	Yes
<i>N</i>	23420	23420	23420

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is qreg. Executor: Zixi Zhang.

Table 9. Mechanism test: information asymmetry (mediating role of analyst attention)

Variable	(1) DEBTCOST1	(2) ANAATT	(3) DEBTCOST1
<i>DEGREE</i>	-0.0758*** (-5.79)	0.5669*** (6.54)	-0.0696*** (-5.34)
<i>SOE</i>	-0.4161*** (-9.85)	-2.0931*** (-8.35)	-0.4387*** (-10.30)
<i>SIZE</i>	-0.0051 (-0.29)	3.5806*** (29.37)	0.0336* (1.76)
<i>BIG4</i>	-0.0874 (-1.09)	0.9729* (1.69)	-0.0769 (-0.98)
<i>LEVER</i>	1.7029*** (14.75)	-1.8870*** (-3.11)	1.6825*** (14.60)
<i>ROA</i>	-3.5218*** (-9.51)	71.9207*** (27.67)	-2.7438*** (-7.20)
<i>GROWTH</i>	-0.0006 (-0.04)	-0.2939*** (-3.27)	-0.0038 (-0.26)

Table 9. Continued

Variable	(1) DEBTCOST1	(2) ANAATT	(3) DEBTCOST1
<i>PPE</i>	0.7439*** (6.12)	-0.1053 (-0.17)	0.7428*** (6.12)
<i>INTEREST</i>	0.9221*** (21.11)	-1.8996*** (-11.34)	0.9015*** (20.76)
<i>FCF</i>	-1.1470*** (-6.06)	4.4906*** (4.26)	-1.0985*** (-5.85)
<i>LOSS</i>	-0.4624*** (-7.99)	-3.6685*** (-12.10)	-0.5021*** (-8.70)
<i>ANAATT</i>			-0.0108*** (-5.81)
<i>CONSTANT</i>	3.3799*** (8.71)	-69.4301*** (-27.42)	2.6288*** (6.44)
<i>YEAR</i>	Yes	Yes	Yes
<i>INDUSTRY</i>	Yes	Yes	Yes
<i>N</i>	23420	23420	23420
<i>R²</i>	0.297	0.373	0.300
<i>R² Adjusted</i>	0.295	0.372	0.298
<i>F</i>	100.1732	75.9623	98.6550

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is reg. Executor: Zixi Zhang.

Table 10. Sobel test: analyst attention

	Analyst Attention
Sobel Test	(-7.480)
Goodman 1 (Aroian) Test	(-7.464)
Goodman-2 Test	(-7.497)
Direct Effect	-0.0696*** (-8.367)
Total Effect	-0.0758*** (-9.110)
Ratio of Intermediary Effect to Total Effect	0.0810

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is sgmediation. Executor: Zixi Zhang.

Table 11. Mechanism test: information asymmetry (mediating effect of attention from research reports)

Variable	(1) DEBTCOST1	(2) REPORTATT	(3) DEBTCOST1
<i>DEGREE</i>	-0.0758*** (-5.79)	1.5066*** (7.05)	-0.0694*** (-5.33)
<i>SOE</i>	-0.4161*** (-9.85)	-4.9673*** (-8.60)	-0.4370*** (-10.27)
<i>SIZE</i>	-0.0051 (-0.29)	7.9203*** (25.79)	0.0283 (1.49)
<i>BIG4</i>	-0.0874 (-1.09)	3.0140** (2.07)	-0.0747 (-0.95)
<i>LEVER</i>	1.7029*** (14.75)	-1.5649 (-1.11)	1.6963*** (14.73)
<i>ROA</i>	-3.5218*** (-9.51)	163.0772*** (25.88)	-2.8329*** (-7.45)
<i>GROWTH</i>	-0.0006 (-0.04)	-0.4874** (-2.28)	-0.0027 (-0.18)
<i>PPE</i>	0.7439*** (6.12)	-0.2645 (-0.18)	0.7428*** (6.12)
<i>INTEREST</i>	0.9221*** (21.11)	-4.1650*** (-10.96)	0.9045*** (20.78)
<i>FCF</i>	-1.1470*** (-6.06)	14.5180*** (5.89)	-1.0857*** (-5.78)
<i>LOSS</i>	-0.4624*** (-7.99)	-8.8306*** (-12.25)	-0.4997*** (-8.66)
<i>REPORTATT</i>			-0.0042*** (-5.42)
<i>CONSTANT</i>	3.3799*** (8.71)	-1.6e+02*** (-24.57)	2.7178*** (6.67)
<i>YEAR</i>	Yes	Yes	Yes
<i>INDUSTRY</i>	Yes	Yes	Yes
<i>N</i>	23420	23420	23420
<i>R²</i>	0.297	0.351	0.299
<i>R² Adjusted</i>	0.295	0.350	0.298
<i>F</i>	100.1732	55.7015	98.6582

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is reg. Executor: Zixi Zhang.

Table 12. Sobel test: research report attention

	Research Report Attention
Sobel Test	(-7.427)
Goodman 1 (Aroian) Test	(-7.412)
Goodman-2 Test	(-7.442)
Direct Effect	-0.0694*** (-8.330)

Table 12. Continued

	Research Report Attention
Total Effect	-0.0758*** (-9.110)

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is sgmediation. Executor: Zixi Zhang.

Table 13. Mechanism test: agency problem (mediating effect of management shareholding)

Variable	(1) DEBTCOST1	(2) MSHARES	(3) DEBTCOST1
<i>DEGREE</i>	-0.0758*** (-5.79)	0.0068*** (3.16)	-0.0739*** (-5.64)
<i>SOE</i>	-0.4161*** (-9.85)	-0.1224*** (-25.96)	-0.4490*** (-10.12)
<i>SIZE</i>	-0.0051 (-0.29)	-0.0093*** (-4.55)	-0.0076 (-0.43)
<i>BIG4</i>	-0.0874 (-1.09)	-0.0057 (-0.78)	-0.0890 (-1.11)
<i>LEVER</i>	1.7029*** (14.75)	-0.0443*** (-3.14)	1.6909*** (14.64)
<i>ROA</i>	-3.5218*** (-9.51)	0.2142*** (4.13)	-3.4641*** (-9.34)
<i>GROWTH</i>	-0.0006 (-0.04)	0.0023 (1.19)	-0.0000 (-0.00)
<i>PPE</i>	0.7439*** (6.12)	-0.0497*** (-4.02)	0.7306*** (6.00)
<i>INTEREST</i>	0.9221*** (21.11)	-0.0117*** (-3.25)	0.9189*** (21.07)
<i>FCF</i>	-1.1470*** (-6.06)	-0.0955*** (-4.19)	-1.1728*** (-6.21)
<i>LOSS</i>	-0.4624*** (-7.99)	0.0103* (1.73)	-0.4596*** (-7.95)
<i>MSHARES</i>			-0.2692*** (-2.79)
<i>CONSTANT</i>	3.3799*** (8.71)	0.3404*** (7.75)	3.4716*** (8.87)
<i>YEAR</i>	Yes	Yes	Yes
<i>INDUSTRY</i>	Yes	Yes	Yes
<i>N</i>	23420	23420	23420
<i>R²</i>	0.297	0.228	0.297
<i>R² Adjusted</i>	0.295	0.227	0.296
<i>F</i>	100.1732	35.8938	98.0097

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is reg. Executor: Zixi Zhang.

Table 14. Sobel test: management shareholding

	Management Shareholding
Sobel Test	(-4.050)
Goodman 1 (Aroian) Test	(-4.021)
Goodman-2 Test	(-4.079)
Direct Effect	-0.0738*** (-8.885)
Total Effect	-0.0758*** (-9.110)
Ratio of Mediating Effect to Total Effect	0.0243

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is sgmediation. Executor: Zixi Zhang.

Table 15. Mechanism test: agency problem (mediating effect of the number of media coverage)

Variable	(1) DEBTCOST1	(2) TITLE	(3) DEBTCOST1
<i>DEGREE</i>	-0.0758*** (-5.79)	7.3197*** (5.93)	-0.0732*** (-5.58)
<i>SOE</i>	-0.4161*** (-9.85)	-27.6531*** (-7.97)	-0.4257*** (-10.06)
<i>SIZE</i>	-0.0051 (-0.29)	33.8518*** (15.81)	0.0067 (0.37)
<i>BIG4</i>	-0.0874 (-1.09)	36.4589*** (3.43)	-0.0747 (-0.94)
<i>LEVER</i>	1.7029*** (14.75)	26.2819*** (2.88)	1.7121*** (14.85)
<i>ROA</i>	-3.5218*** (-9.51)	224.8541*** (6.19)	-3.4430*** (-9.31)
<i>GROWTH</i>	-0.0006 (-0.04)	3.4506** (2.43)	0.0006 (0.04)
<i>PPE</i>	0.7439*** (6.12)	-21.6839** (-2.52)	0.7364*** (6.06)
<i>INTEREST</i>	0.9221*** (21.11)	-3.0814 (-1.13)	0.9210*** (21.11)
<i>FCF</i>	-1.1470*** (-6.06)	-6.6079 (-0.44)	-1.1494*** (-6.08)
<i>LOSS</i>	-0.4624*** (-7.99)	-32.2741*** (-6.75)	-0.4737*** (-8.18)
<i>MSHARES</i>			-0.0004*** (-2.62)
<i>CONSTANT</i>	3.3799*** (8.71)	-6.6e+02*** (-14.51)	3.1490*** (7.95)
<i>YEAR</i>	Yes	Yes	Yes
<i>INDUSTRY</i>	Yes	Yes	Yes

Table 15. Continued

Variable	(1) DEBTCOST1	(2) TITLE	(3) DEBTCOST1
<i>N</i>	23420	23420	23420
<i>R</i> ²	0.297	0.350	0.297
<i>R</i> ² Adjusted	0.295	0.349	0.296
<i>F</i>	100.1732	169.7048	97.8993

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is reg. Executor: Zixi Zhang.

Table 16. Sobel test: media coverage

	Media Coverage
Sobel Test	(-4.058)
Goodman 1 (Aroian) Test	(-4.043)
Goodman-2 Test	(-4.073)
Direct Effect	-0.0732*** (-8.783)
Total Effect	-0.0758*** (-9.110)
Ratio of Mediating Effect to Total Effect	0.0338

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is sgmediation. Executor: Zixi Zhang.

Table 17. Further test: moderating effect of market competition

Variable	(1) HIGH	(2) LOW
<i>DEGREE</i>	-0.1085*** (-7.18)	-0.0476*** (-3.47)
<i>SOE</i>	-0.5447*** (-14.41)	-0.3664*** (-12.63)
<i>SIZE</i>	0.2174*** (9.46)	-0.0412*** (-3.05)
<i>BIG4</i>	-0.2230 (-1.62)	-0.0218 (-0.50)
<i>LEVER</i>	2.5358*** (23.20)	1.0418*** (10.70)
<i>ROA</i>	-4.1223*** (-8.90)	-4.0135*** (-10.00)
<i>GROWTH</i>	0.0036 (0.12)	-0.0010 (-0.05)
<i>PPE</i>	1.1306*** (10.17)	0.4729*** (5.95)
<i>INTEREST</i>	0.6180*** (13.08)	1.1459*** (28.52)

Table 17. Continued

Variable	(1) HIGH	(2) LOW
<i>FCF</i>	-1.3014*** (-4.96)	-0.8856*** (-4.57)
<i>LOSS</i>	-0.3470*** (-4.61)	-0.5660*** (-8.65)
<i>CONSTANT</i>	-2.1731 (-1.25)	2.8421*** (6.12)
<i>YEAR</i>	Yes	Yes
<i>INDUSTRY</i>	Yes	Yes
<i>P-Value</i>	P=0.0357	
<i>N</i>	11710	11710
<i>R²</i>	0.226	0.276
<i>R² Adjusted</i>	0.224	0.273
<i>F</i>	103.2865	110.9847

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is reg and suest. Executor: Zixi Zhang.

Table 18. Further test: moderating effect of firms in high-tech industry

Variable	(1) HIGH-TECH	(2) NON HIGH-TECH
<i>DEGREE</i>	-0.1197*** (-8.47)	-0.0491*** (-4.75)
<i>SOE</i>	-0.5993*** (-14.75)	-0.3719*** (-17.17)
<i>SIZE</i>	0.0791*** (4.05)	-0.0207** (-2.14)
<i>BIG4</i>	-0.3505*** (-3.74)	-0.0491 (-1.25)
<i>LEVER</i>	1.7619*** (14.68)	1.6741*** (24.75)
<i>ROA</i>	-3.4823*** (-7.48)	-3.5430*** (-12.11)
<i>GROWTH</i>	-0.0310 (-1.02)	0.0070 (0.44)
<i>PPE</i>	0.8964*** (6.87)	0.7126*** (11.84)
<i>INTEREST</i>	0.7459*** (13.36)	0.9597*** (33.87)
<i>FCF</i>	-1.6525*** (-5.68)	-1.0573*** (-7.25)
<i>LOSS</i>	-0.2371*** (-2.74)	-0.5199*** (-11.30)
<i>CONSTANT</i>	0.5084 (1.24)	3.3796*** (16.11)
<i>YEAR</i>	Yes	Yes
<i>INDUSTRY</i>	Yes	Yes

Table 18. Continued

Variable	(1)	(2)
	HIGH-TECH	NON HIGH-TECH
<i>P-Value</i>	P=0.0340	
<i>N</i>	4761	18659
<i>R²</i>	0.296	0.285
<i>R² Adjusted</i>	0.292	0.283
<i>F</i>	79.5613	194.8712

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is reg and suest. Executor: Zixi Zhang.

Table 19. Further test: moderating effect of audit quality

Variable	(1)	(2)
	“Big Four” Audit	Non-“Big Four” Audit
<i>DEGREE</i>	-0.1691*** (-5.17)	-0.0705*** (-8.22)
<i>SOE</i>	-0.5471*** (-7.38)	-0.4123*** (-20.86)
<i>SIZE</i>	-0.0649*** (-2.69)	0.0133 (1.44)
<i>LEVER</i>	1.1615*** (4.79)	1.6985*** (27.83)
<i>ROA</i>	-4.6416*** (-4.52)	-3.5429*** (-13.85)
<i>GROWTH</i>	-0.0293 (-0.56)	0.0017 (0.11)
<i>PPE</i>	0.5877*** (3.28)	0.7850*** (13.82)
<i>INTEREST</i>	1.0612*** (10.75)	0.9101*** (34.98)
<i>FCF</i>	1.2287** (2.17)	-1.2357*** (-9.24)
<i>LOSS</i>	-0.5393*** (-3.34)	-0.4620*** (-11.05)
<i>CONSTANT</i>	4.7188*** (6.40)	2.9828*** (14.87)

Table 19. Continued

Variable	(1) “Big Four” Audit	(2) Non-“Big Four” Audit
<i>YEAR</i>	Yes	Yes
<i>INDUSTRY</i>	Yes	Yes
<i>P-value</i>	P=0.0491	
<i>N</i>	1514	21906
<i>R²</i>	0.362	0.300
<i>R² Adjusted</i>	0.346	0.299
<i>F</i>	22.0491	240.4943

Note: ***, ** and * represent significance levels of 1%, 5% and 10% respectively, and values in brackets are T values. The command used is reg and suest. Executor: Zixi Zhang.